

REMARKS

The prior rejection of Claims 1-24 has been withdrawn in response to the Amendment filed September 14, 2007 and replaced with the current rejection.

Claims 1 was rejected under 35 U.S.C. §102(e) as being anticipated by US Pat. Appl. Pub. No. 2004/0015104 (Goldberger). Amended Claim 1 describes an ultrasonic diagnostic imaging system probe comprising an ultrasonic transducer array; an integrated circuit coupled to the ultrasonic transducer array which acts to process or control transducer array signals; a fuel cell coupled to the integrated circuit for energizing the integrated circuit; and a source of replaceable fuel coupled to the fuel cell. A probe of the present invention does away with the need to replace or recharge the batteries which power an ultrasound probe. Instead, the fuel source for the fuel cell can be refueled to immediately resume scanning with a newly energized probe. Dependent Claim 6 specifies two particular types of fuel sources, a fuel cartridge and an ampule.

Goldberger is not concerned with an ultrasound imaging system or a diagnostic ultrasound system. His device is a therapy device which agitates the blood by acoustic streaming to prevent development of a blood clot, as can develop when blood is not flowing during atrial fibrillation. Furthermore Goldberger's device is not an externally operated medical device as are all of the devices of the present claimed invention. Instead, Goldberger's device is surgically implanted in the body like a pacemaker. A lead extends from the battery-powered electronic module 12 to a piezotransducer (PZT) which is attached on a wall of the atrium as shown in Goldberger's Fig. 1 or on a collar 42 surrounding a vessel as shown in Fig. 3. The PZT is periodically energized to transmit ultrasonic energy to the atrium to agitate, stir, or cavitate the blood by an acoustic streaming effect. Since the purpose of the device

is simply to irradiate the area in front of the PZT with ultrasound energy, no steering or focusing of a beam is employed as is the case of an array transducer of an imaging probe. There is no reception by Goldberger's PZT element since there is no need to and no imaging is being performed.

Goldberger says in paragraph [0028] that his device is powered by a rechargeable battery or a hydrogen-oxygen fuel cell, or any other means of providing electrical power. The battery 46 is shown as a cross-hatched area of Goldberger's electronic module with no further details. If the fuel cell battery is depleted, a surgical procedure must be performed to replace the fuel cell battery. Goldberger does not call for a source of replaceable fuel as recited in Claim 1. The Examiner asserts that a source of fuel coupled to the fuel cell is found in paragraph [0028] of Goldberger, but a reading of this paragraph shows that this is not the case. When the fuel cell no longer functions it must be retrieved by surgery and replaced. It is thus seen that there are numerous features of amended Claim 1 that are not found in or not true of the Goldberger implanted therapy device. It is respectfully submitted that any one of these differences prevent Goldberger from anticipating amended Claim 1.

Claims 2 and 3 were rejected under 35 U.S.C. §103(a) as being unpatentable over Goldberger in view of U.S. Pat. 5,817,024 (Ogle et al.) Claim 2 has been canceled. By this combination the Examiner would add the beamformer of Ogle et al. to the therapy device of Goldberger. This combination does not make sense or serve a purpose in Goldberger's device. The purpose of a beamformer is to steer and focus an imaging beam to and from an array of transducer elements. Goldberger does not do any beamforming or have the need to do so, he simply irradiates the blood in front of the PZT through a lens 78 or 79. Consequently, a beamformer serves no purpose for the Goldberger device. One skilled in the art would not consider modifying the Goldberger device with a beamformer, since there would be no purpose served in

doing so. For these reasons it is respectfully submitted that Ogle et al. and Goldberger cannot be combined to render Claim 3 unpatentable.

Claims 4-9 were rejected under 35 U.S.C. §103(a) as being unpatentable over Goldberger in view of U.S. Pat. 7,005,206 (Lawrence et al.) Lawrence et al. describes a fuel cell assembly for a consumer electronics product such as a mobile telephone, portable computer, or PDA (col. 3, lines 32-33). To provide oxygen for the reaction with the methanol fuel, ambient air is admitted to one side of the membrane electrode assembly as shown in Fig. 5. Ambient air is admitted to the membrane electrode assembly through intake ports 82 located in air grooves 76 as shown in Fig. 1.

This may all work very well for a consumer electronic product as Lawrence et al. contend, but the Goldberger device is implanted. There is no source of ambient air. As Goldberger states in paragraphs [0027]-[0028], his electronic module 12 is completely sealed to isolate the internal components of the device from the patient. This further assures biocompatibility for his device, which is mandated for implantable devices by the FDA. Since Goldberger's battery is sealed inside the patient it must have its own internal source of oxygen. Goldberger thus describes his battery as a "hydrogen-oxygen" fuel cell. How he makes this or where he gets one is not specified. There is only a cross-hatched grid where the battery is said to be in Goldberger's electronic module. Consequently one skilled in the art would never consider combining the Lawrence et al. fuel cell assembly with the Goldberger device since the Lawrence et al. ambient air fuel cell will not work in the sealed Goldberger device.

Moreover, combining bits and pieces of the Lawrence et al. fuel cell assembly with Goldberger is inapposite because in most instances there is no reason for doing so. For instance, the Examiner suggests combining the voltage boost

converter circuit of Lawrence et al. with the Goldberger device. However, Goldberger indicates no need for a higher voltage level and only requires a "stable DC voltage" for which he already supplies a voltage regulator 58. Goldberger has no need for a replaceable fuel cartridge or ampule, which Lawrence et al. says at the top of column 3 is provided so that their fuel cell assembly can be "quickly and conveniently refueled." There is nothing quick and convenient about the surgical procedure needed to replace the Goldberger battery and there is no means for refueling the Goldberger device. For all of these reasons it is respectfully submitted that Goldberger and Lawrence et al. cannot be combined to render Claims 4-9 obvious.

Claims 10-24 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ogle et al. in view of Goldberger and Lawrence et al. Claims 10-24 all describe ultrasonic diagnostic imaging systems with elements utilized specifically for diagnostic imaging such as beamformers, ultrasound signal paths and signal processors, control panels and displays. These imaging systems are all used outside the body. The claimed systems all call for a fuel cell and a replaceable fuel source. The Goldberger device is a surgically implanted device that is completely self-contained and sealed. It has no replaceable fuel source, only the option of surgery to replace the hydrogen-oxygen fuel cell. The fuel cells of the imaging systems of Claims 10-24 can all draw their oxygen from the air around the systems as stated on page 5, line 14 of the present specification, since they are all used outside the body. The Goldberger device cannot. Ogle et al. describe a handheld ultrasonic imaging system with components and functions similar to the claimed ultrasound imaging invention of Claims 10-24. All of the reasons described above for the inapplicability of the Goldberger device to the claimed invention apply equally to combination with the ultrasonic imaging system of Ogle et al. One skilled in the

art would not consider combining them as the rejection suggests. As described above in respect to Claims 4-9, the fuel cell assembly of Lawrence et al. cannot be logically combined with the Goldberger implanted device.

Furthermore, there is no reason for combining Lawrence et al. with Ogle et al. absent the teachings of the present invention. Ogle et al. make use of a power subsystem 80 which uses a rechargeable battery or an a.c. adapter. There is no reason for replacing this power subsystem with Lawrence et al.'s fuel cell assembly absent the present application. As mentioned in the previous response in this case, a fuel cell with a replaceable fuel source would not logically commend itself for use with medical instruments due to concerns for patient and medical personnel safety in a hospital or similar setting, nor would the devices and configurations in which a fuel cell would be best applied. The present inventors have addressed these issue in their inventive devices by thinking through the configurations of ultrasound probes and systems, including handheld systems (Claims 10-19) and cart-borne and tabletop systems (Claims 20-24) which can safely and effectively benefit from fuel cell technology, none of which is suggested by Lawrence et al.

It is further noted that Claims 20-23 call for an ultrasonic imaging system with both a source of a.c. power coupled to energize the ultrasound signal path and a fuel cell coupled to energize the ultrasound signal path. This dual energy supply configuration enables the ultrasound signal path to be a.c. powered when the system is plugged in, and powered by the fuel cell when unplugged or being moved. Such a dual energy configuration is not shown or suggested by any of the citations or the citations in combination. For all of these reasons it is respectfully submitted that Claims 10-24 are patentable over the proposed combination of Ogle et al., Goldberger, and Lawrence et al.

In view of the foregoing amendments and remarks, it is respectfully submitted that Claim 1 is not anticipated by Goldberger, that Claim 3 is patentable over Goldberger and Ogle et al., that Claims 4-9 are patentable over Goldberger and Lawrence et al., and that Claims 10-24 are patentable over Ogle et al., Goldberger, and Lawrence et al. Accordingly it is respectfully requested that the rejection of Claim 1 under 35 U.S.C. §102(e) and of Claims 3-24 under 35 U.S.C. §103(a) be withdrawn.

In light of the foregoing amendment and remarks, it is respectfully submitted that this application is now in condition for allowance. Favorable reconsideration is respectfully requested.

Respectfully submitted,

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